
Meridian 1

Nortel COMPANION Microcellular Multi-Site Networking

Description, operations, and administration

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About this guide

This guide provides information on the operation and administration for the Nortel COMPANION Microcellular Multi-Site Networking Option.

To support Multi-Site Networking, the Companion Microcellular product must already be installed on each Meridian 1 system of your private network that supports a roaming user. For more information on the Companion Microcellular product, see the following documents:

- *Nortel COMPANION Microcellular Overview (553-3611-100)*. Describes the Microcellular system and its product features.
- *Nortel COMPANION Microcellular Site planning and deployment guide (553-3611-105)*. Provides deployment information that helps determine how many antennas, Base Stations, radios, and other equipment that a Microcellular site requires and where to install the Microcellular hardware.
- *Nortel COMPANION Microcellular Installation guide (553-3611-200)*. Explains the procedures for installing and configuring Microcellular hardware and software components.
- *Nortel COMPANION Microcellular Operations, administration, and maintenance guide (553-3611-300)*. Explains the OA&M procedures for a Microcellular system.
- *Nortel COMPANION Microcellular Feature card (P0841607)*. Describes the features available on a portable telephone in a Microcellular system and explains how to use the features.

For a description of Networking configuration, see the following documents:

- *Electronic Switched Network description* (309-3001-100) introduces ESN, a private communications network intended for large businesses with distributed operating locations. Concepts described include network class of service, network alternate route selection, network control, network signaling, routing control, call back queuing, off hook queuing, network authorization codes, coordinated dialing plan, and network traffic measurements.
- *Electronic Switched Network transmission guidelines* (309-3001-181) describes the major transmission considerations in planning for an ESN. Topics include transmission planning and performance for on-network calls, tandem combinations of public and private network trunks, and remote network access.
- *Basic and Network Alternate Route Selection description* (553-2751-100) introduces concepts necessary for creating a private telecommunications network with switches in different locations. Information includes network access codes, uniform dialing plan, dialing transparency, automatic least-cost routing, routing and network controls, digit manipulation, free calling area screening, and expensive route warning tone.
- *ISDN Primary Rate Interface description and administration* (553-2901-100) introduces the ISDN and describes the features available on the Meridian 1 with ISDN PRI. Topics include an overview, PRI configuring, PRI service verification, coordinating PRI parameters, and engineering guidelines, as well as description of specific PRI features.
- *X11 input/output guide* (553-3001-400) serves as a reference guide for system administrators. It includes instructions for using administration and maintenance programs to configure and equip Meridian 1 features.

Product overview

Companion Microcellular provides both in-building and wide area mobility using a single standard cellular portable. For additional information, see the *Nortel COMPANION Microcellular Overview (553-3611-100)*.

Multi-Site Networking is an optional feature of the Microcellular product that enables portable users to place and receive calls from their portables at various networked locations. It supports incoming call delivery to and outgoing call origination from a roaming portable at any visited Meridian 1 PBX with Release 22 or later within a single private network. The Meridian 1 systems must be connected via PRI using the Meridian Customer Defined Network (MCDN). This means that any visited Meridian 1 PBX must be on the same private network as the portable's home Meridian 1 system.

To support Multi-Site Networking, the customer must have the following prerequisites:

- 1** Meridian Customer Defined Network (MCDN)
- 2** Microcellular packages 302 and 303 and all Microcellular equipment installed at the user's home site and at each visited site
- 3** Multi-Site Network Option package 314 installed at the user's home site and at each visited site
- 4** All Meridian 1 systems on the same network must use a homogenous dialing plan. It can be either the Uniform Dialing Plan (UDP) or the Coordinated Dialing Plan (CDP), but not both. Multi-Site Networking does not support mixed dialing plans.

Note: For a detailed description of ESN Networking and ISDN Primary Rate Interface, see *Electronic Switched Network description* (309-3001-100) and *ISDN Primary Rate Interface description and administration* (553-2901-100)

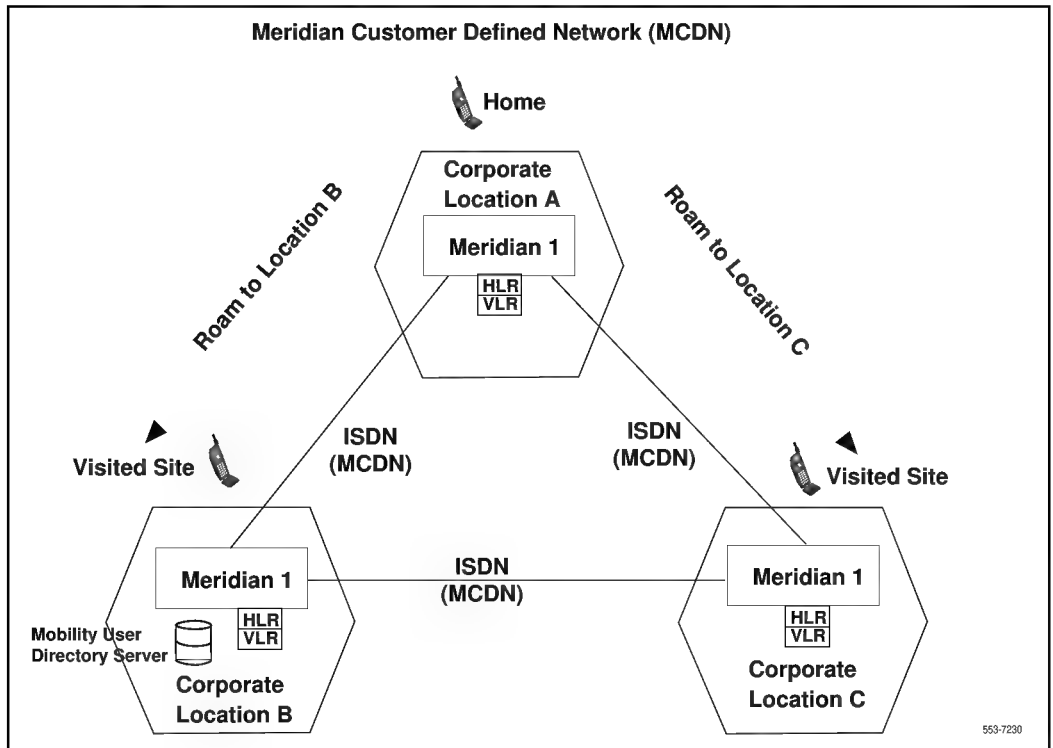
5 Common customer Private Network Identifier (PNI)

Note: For a description of PNI, see *X11 input/output guide* (553-3001-400) and the feature implementation section of the Network Ring Again feature in *ISDN Primary Rate Interface description and administration* (553-2901-100)

Feature operation

With Multi-Site Networking, Microcellular users registered on a Meridian 1 system within a private network are able to place and receive calls at various locations throughout that private network. Figure 1 illustrates the basic components that comprise the Multi-Site Networking feature. Following is a brief description of each component in the mobility network.

Figure 1
Multi-Site Networking overview



- **Home Site.** Home refers to the location of the Meridian 1 system in which the user's portable is configured.
- **Visited Site.** The portable user can roam to a site that is the location of another Meridian 1 system on the same private network.
- **Mobility User Directory Server.** The Mobility User Directory

server maps the Mobile Identification Numbers (MINs) that the cellular operator assigns and Electronic Serial Numbers (ESNs) that portable manufacturers provide into the private network Directory Numbers (DNs). Each portable has a unique MIN and ESN. The Mobility User Directory server contains a *centralized* multi-site user database that stores information about all portables in the network. Only one Mobility User Directory server is required for the network and it can reside at any Meridian 1 location on the private network. Figure 1 shows the Mobility User Directory server running on the Meridian 1 system at Corporate Location B.

- **Meridian 1 HLR/VLR.** Meridian 1's Home Location Register (HLR) and Visitor Location Register (VLR) are a collection of objects which store information about users who are local to a given switch and users who are visiting the local switch.
- **PRI.** The private network of Meridian 1 systems connects via PRI. The Meridian Customer Defined Network (MCDN) provides communications between the Meridian 1 systems.

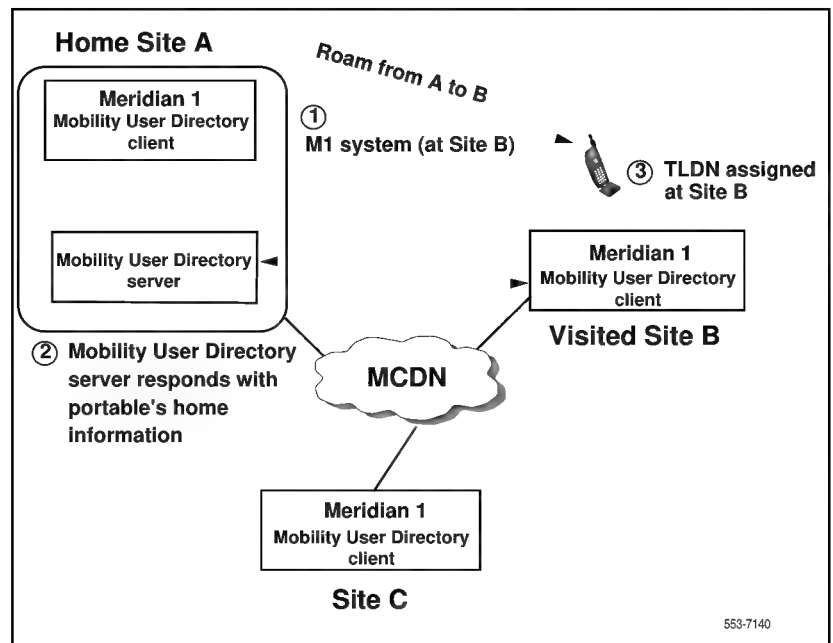
Mobility User Directory server

The administrator of a private mobility network does not have control over the value of a Mobile Identification Number (MIN), which the cellular operator provides, or an Electronic Serial Number (ESN), the serial number that the manufacturer assigns to uniquely identify each portable. The Microcellular system uses a Mobility User Directory server to map the MINs and ESNs to the Directory Numbers (DNs) of a private mobility network. The Mobility User Directory server, a software application that stores data on the Meridian 1 hard disk, does not require any special hardware.

Figure 2 depicts a private network of three Meridian 1 systems with the Mobility User Directory server residing at Site A. Refer to the numbers in Figure 2 that correspond to the following description for the registration process.

- 1 When a visiting portable registers at a visited Meridian 1 system (for example, Site B in Figure 2), the visited Meridian 1 system queries the centrally located Mobility User Directory server on the network for the portable's corporate DN.
- 2 The Mobility User Directory server will respond with the roaming portable's corporate DN. The visiting portable's home location can be determined from this DN.
- 3 A Temporary Local Directory Number (TLDN) is assigned to the portable (at the visited site) for call processing.

Figure 2
Mobility User Directory



It is possible to have customers of different private networks connected at the same Meridian 1 switch. To illustrate this, Figure 3 shows that Company A's private network includes San Jose, Dallas, and New York City. Company Z's private network includes Chicago, Raleigh, and New York City. The Meridian 1 PBX in New York City is an example of two customers from different private networks connected to a single switch.

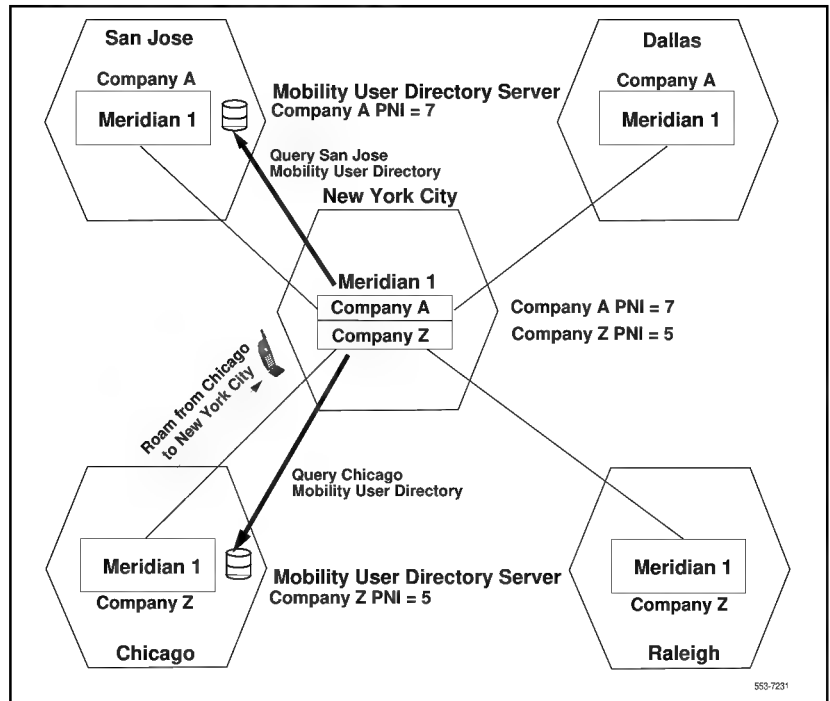
Figure 3 also depicts a portable that has roamed from Company Z's location in Chicago to Company Z's location in New York City. When this visiting portable registers at the New York site, the Meridian 1 system queries all local customers' Mobility User Directory servers for the portable's corporate DN. Since the New York Meridian 1 system has two local customers (from different networks) connected to it, it queries Company A's Mobility User Directory server in San Jose as well as Company Z's Mobility User Directory server in Chicago.

The Private Network Identifier (PNI) helps to identify which private network this portable belongs to. Since the MIN is unique, only one Mobility User Directory server will respond with the roaming portable's corporate DN. In this illustration, since Company Z's PNI is 5, the visiting portable's home location can be determined by the information from the Mobility User Directory server with PNI = 5; which is the Mobility User Directory server at Company Z's location in Chicago.

Mobility User Directory entries are stored in the Mobility User Directory server at a centralized location that is accessible to all wireless customers at all Meridian 1 systems within the network. Each entry consists of the portable's MIN, ESN, and home DN and the customer's Private Network Identifier (PNI). As illustrated in Figure 3, the PNI is a number that uniquely identifies a particular private network. In Figure 3, Company A's PNI is 7, and Company Z's PNI is 5.

The main Mobility User Directory services are operations, administration, and maintenance (OA&M) and registration/deregistration.

Figure 3
Two different private networks

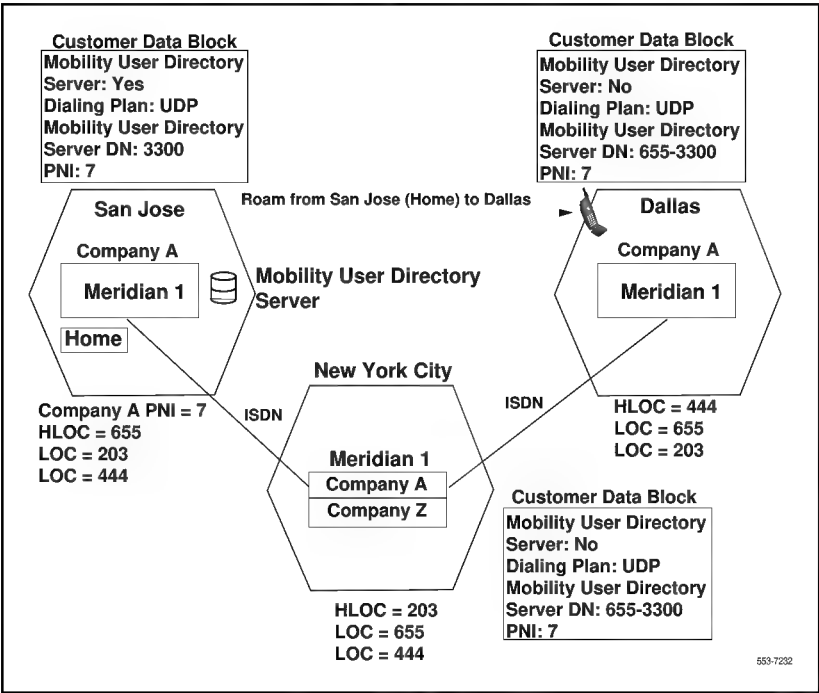


OA&M

- **Mobility User Directory server address.** The Mobility User Directory server DN is defined in the customer data block at the Meridian 1 system where the Mobility User Directory server will be running. The PNI and DN of the Mobility User Directory server must also be configured at each Meridian 1 system on the network.
- **Add/Delete entries.** Entries are automatically added to or deleted from the Mobility User Directory database when a portable is configured or deleted from the Microcellular system.

Figure 4 shows some of the parameters that are configured in the Customer Data Block (Overlay 15) at each Meridian 1 system on the private network. In this example, Company A's Mobility User Directory server is located in San Jose. Note that when configuring the Customer Data Block for the Meridian 1 system that is running the Mobility User Directory server, the answer to the Mobility User Directory Server prompt is 'YES'. All other Meridian 1 systems on the network answer 'NO' to the Mobility User Directory Server prompt in the Customer Data Block. Also note that the dialing plan is consistent at each Meridian 1 system (in this example, the dialing plan is UDP). The Directory Number (DN) of the Mobility User Directory server and the PNI number are also required to configure at each Meridian 1 system on the network. See the Administration chapter for details on the Overlays required to configure the Multi-Site Networking option.

Figure 4
Operations, Administration, and Maintenance (OA&M)



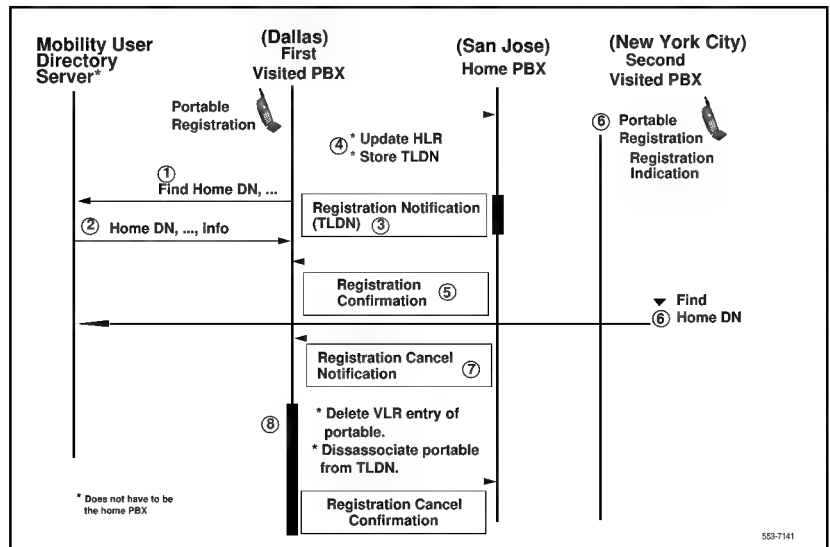
Registration

When a portable user roams to any Meridian 1 system on the network, with the portable turned on, the registration process automatically begins if the PSID of the visited site is programmed correctly in the portable. The illustration in Figure 5 first shows a user roaming from a portable's home system (in San Jose) to Dallas. Subsequently, the user roams from Dallas to New York.

First, the Dallas system checks its own Home Location Register (HLR). If the roaming portable is not known to this visited system's HLR, then the Meridian 1 system queries the Mobility User Directory server for the corporate DN of the visiting portable with a particular MIN. After detecting the roaming portable's presence through its registration attempt, the visited Meridian 1 system starts the Visitor Location Register (VLR) processing if the portable is unknown to it.

Refer to the numbers in Figure 5 that correspond to the following description for the registration process.

Figure 5
Portable registration/deregistration between visited systems



Note: When the portable registers on the system, the registration process is automatically handled by the Meridian 1 PBX at the Dallas site.

- 1 Using the portable's MIN, the Dallas PBX queries the Mobility User Directory server for the roaming portable's "Home" information.
- 2 The Mobility User Directory server responds with the portable's MIN, PNI, DN, and ESN.
- 3 The Dallas PBX sends a Registration Notification to the portable's home PBX (San Jose). The Registration Notification includes the Temporary Local Directory Number (TLDN) assigned to the portable by the Dallas PBX.
- 4 Upon receipt of the Registration Notification, the home PBX's HLR (Home Location Register) updates the location field of the indicated portable to the visited PBX ID (for the Dallas site) and stores the Temporary Local Directory Number (TLDN) for later call deliveries.
- 5 The home system sends a Registration Confirmation response back to the Dallas PBX. Based on the primitives received from the Registration Confirmation response, a VLR (Visitor Location Register) entry will be added at the Dallas PBX.

Deregistration

When a portable user roams to another visited site, with the portable on, the user automatically obtains service because the Microcellular system performs **both** deregistration from the previous site and registration to the new site automatically. For example, in Figure 5 the portable user leaves Dallas and roams to New York City. The deregistration process at the Dallas PBX automatically occurs, and another registration process begins at the New York PBX.

Refer to the numbers in Figure 5 that correspond to the description of the deregistration process.

- 6 The user roams to the New York site, where the New York PBX handles the registration process (which steps 2 through 6 describe).
- 7 Because the portable was registered in Dallas, the deregistration process also occurs. The home PBX sends a Registration Cancel notification to the Dallas PBX.

- 8 Upon receipt of the cancellation message, the Dallas PBX deletes the VLR entry of this portable, disassociates the portable from the TLDN, and sends back a Registration Cancel Confirmation response to the portable's home PBX.

Feature capabilities

This section discusses the basic capabilities of the Multi-Site Networking feature.

Portable roaming from home to visited site

When the portable roams from the home to a visited Meridian 1 PBX system, any features which were activated by the portable user at the home system will be cancelled/deactivated except for the Call Forward All Calls feature. Figure 6 helps to illustrate this capability. The example illustrates two scenarios at the home system; one where the user has Call Forward All Calls activated at the home system and one where Call Forward All Calls is deactivated. Refer to the numbers that correspond to the following description.

- 1 The user roams from the home location to Site A.
- 2 An incoming call is received by the home system.
- 3 Since Call Forward All Calls is activated, the incoming call will be forwarded to the partner's office.
- 4 If Call Forward All Calls is not activated, the incoming call will be forwarded to the location of the user.
- 5 If the roaming user does not answer, then the incoming call receives home treatment on the forward DN (for example, Voice Mail).

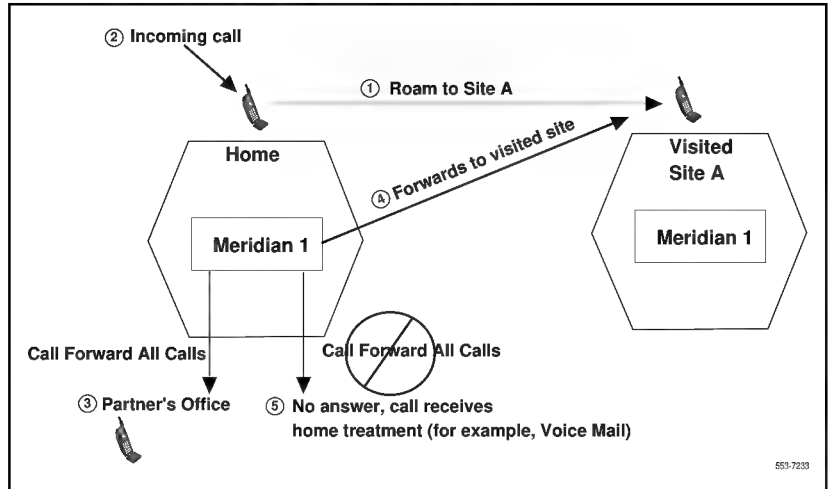
Feature capabilities provided by visited system

While at the visited site, when a portable user activates a feature or initiates an outgoing call, the request is handled by the visited Meridian 1 system. This means that the portable user is "governed" by the features available at the visited system and is authorized for use by TLDNs via Class of Service designations. In other words, a portable which can access features at its home system may not be able to access those same features when it is at the visited system. The roamed user will be restricted to those features that are available at the visited system.

Portable roaming from one visited site to another

When the portable roams from one visited system to another, all the activated features at the previous visited system are automatically cancelled when the portable registers at the new site. Figure 7 helps to illustrate this capability.

Figure 6
Feature capability at home and visited site



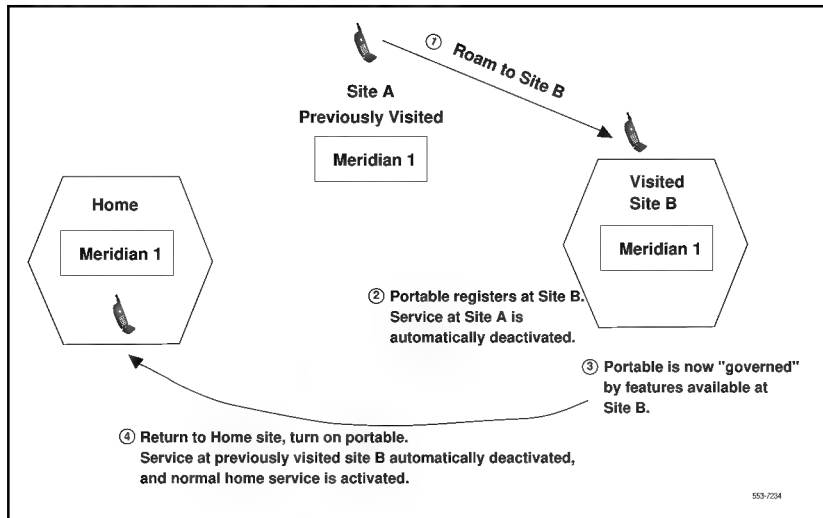
Refer to the numbers in Figure 7 that correspond to the following description.

- 1 The user visits site A and then roams to site B.
- 2 When Multi-Site Networking detects the portable at Site B, the features at Site A for that portable are automatically deactivated. (This occurs when Site A deletes the portable from its VLR.)
- 3 The roaming portable can now use only the features available at the visited Meridian 1 system at Site B.
- 4 When the user returns to the portable's home system, with the portable on, the Meridian 1 automatically deactivates the service at Site B for that portable and activates normal home service for the user.

ESN dialing plan

Electronic Switched Network (ESN) provides a Uniform Dialing Plan (UDP) and a Coordinated Dialing Plan (CDP). When a portable user roams to a visited Meridian 1 system, the visited Meridian 1 dialing plan is used to access the ESN network. This includes using the access code (AC1, AC2) of the visited system.

Figure 7
Feature capabilities at roaming sites



ESN access code

Access to ESN is obtained by dialing one of the two customer-assigned network access codes; AC1 and AC2. Typically, AC1 is used for on-net and long distance calls and AC2 is used for off-net or local calls. However, a 1 or 2 digit access code can be configured per customer provided no conflict exists within the customer dialing plan. For more information on ESN access codes, see the documentation from the Meridian 1 Networking Volume.

System requirements and limitations

The following is a list of general system requirements and limitations of the Multi-Site Networking option. See the Feature support section for additional information on supported features for the Multi-Site Networking option.

- Handoffs between Meridian 1 systems are not supported.
- Handoff between the Microcellular system and the public cellular network is not supported.
- Each Meridian 1 in the mobility network must have its own connection to the region's Cellco Mobility Control Point (CMCP). The CMCP provides the cellular operator with control over private microcellular systems within its licensed region and frequencies.
- All Meridian 1 systems in the mobility network must use a homogenous dialing plan. It can be either the Uniform Dialing Plan (UDP) or the Coordinated Dialing Plan (CDP), but not both. Multi-Site Networking does not support mixed dialing plans.
- If the Mobility User Directory server is not accessible due to link failure or node failure, visiting portables trying to register at a switch for the first time cannot register.
- If no Temporary Local Directory Numbers (TLDNs) are available, visiting portables trying to register at a switch for the first time cannot register.
- If a feature or service is not supported at the visited system, then the roaming user cannot activate or use it even if it is subscribed at the home system.
- When a roaming user leaves a Meridian Mail message for another set, the TLDN will be stored as the calling party's DN. Therefore, when the called party invokes the "Call Sender" feature from Meridian Mail, the TLDN will be dialed. In the mean time, if the TLDN has been assigned to another visiting portable, the wrong user will be called.
- When a roaming user makes a call, the assigned TLDN will be used instead of the portable's home DN for the ORIG field in CDR records. In addition, if the called party's set has Calling Line Identification (CLID) display capability, the TLDN will be shown.

- When a roaming user makes a call, the portable's home calling party name will not be shown on the called party's set. The name of the TLDN (if configured) will be displayed instead.
- When the Meridian 1 PBX connects a set to a roaming portable, the set will display the TLDN, not the actual DN of the portable.
- If a portable's DN is a multiple appearance DN, incoming calls will be delivered to the visited switch. Only the set at the visited site will ring.
- All portables are removed from the TLDN group at midnight at a visited site. TLDNs can be reassigned.
- The correct PSID must be programmed into a portable for inter- and intra-SDC and for inter- and intra-SID.
- Message Waiting Indication is not supported at the visited site.
- If the home and visited sites are served by two different macro cell sites (or macro channels), an IS136-Rev A portable is required to perform 'private sector search' at the visited site.

Feature support

This section discusses *only* those Companion Microcellular features that are not available when roaming and those features that operate differently at a visited location. All other Companion Microcellular features operate transparently with the Multi-Site Networking option. Hence, it is important that the user fully understands the features and capabilities of the Microcellular system before reading this section. Detailed information on Microcellular features may be found in the *Nortel COMPANION Microcellular Overview (553-3611-100)* and the *Nortel COMPANION Microcellular Operations, administration, and maintenance guide (553-3611-300)*.

The following table lists the features supported with Multi-Site Networking. The table has a ‘Supported’ column and a ‘Comments’ column. A ‘Y’ in the Supported column means that this feature is supported, but that it operates differently when used with Multi-Site Networking than it does when used in a single-site Microcellular environment. Text in the Comments column refers you to additional information about the feature operation. This information follows the table and is organized in alphabetical order. A ‘N’ in the Supported column means that this feature is not supported for the Multi-Site Networking option.

Table 1
Multi-Site Networking feature support

Feature	Supported
Automatic Timed Reminders	N
Call Forward Busy	N
Call Forward No Answer	N
Call Forward External Allow/Deny	Y
Call Park	Y
Call Transfer	Y
Call Waiting	Y
Calling Line Identification (CLID)	Y
Conference (3 Party)	Y
Intercept	Y
Message Waiting Indication	N
Multiple Appearance Directory Number	N
Network Call Transfer	Y
Network Hunting	N
Network Meridian Mail	Y
System Speed Call	Y
Note: A portable user can activate a feature only if the feature is equipped on the visited switch.	

Call Park

Call Park enables an attendant or a station to park a call on a Directory Number (DN) so that any user can connect to the call from any attendant console or station. A parked call does not occupy any DN, but a user can use a System Park DN or any station DN as an access identifier to retrieve the parked call.

A call can be parked via a PARK key or by (Special Service Prefix) SPRE access and retrieved by dialing the System Park DN. Alternatively, for a call parked against a station DN, it is retrieved by using a SPRE code access and the station DN. A parked call is placed into the park queue until retrieval time.

A portable can place and retrieve a call in Park. In addition, a portable DN can be used as a station park DN. Furthermore, a portable call can be placed in Park.

For Multi-Site Networking, the Call Park feature must be supported by the visited switch in order to be accessed by the roaming portable user. The portable user will need to park the call using the Mobility Special Service Prefix (MSPRE) code and the system park DN or some other station DN of the visited switch.

Call Transfer

Call Transfer allows a telephone user on any two-party call to hold the existing call and originate another call to a third party. The user may then consult privately or transfer the original call to the third party.

For Multi-Site Networking, a portable user can transfer a call as well as can be transferred at the visited system. However, the portable user has to follow the visited system's numbering plan when transferring a call.

Calling Line Identification (CLID)

Multi-Site Networking affects Calling Line Identification (CLID) in the following manner:

- The caller of the roaming portable will not see the portable's Directory Number (DN) on the set display. The caller will see the Temporary Local Directory Number (TLDN) assigned to the portable.
- When a portable user calls another Meridian 1 set, the receiving set will not display the portable's DN. The receiver will see the TLDN assigned to the portable.

Intercept

Intercept treatments can be defined in the customer data block (Overlay 15) to handle calls that cannot be completed due to call restrictions or dialing irregularities. A variety of treatments can be specified for calls from four categories of originating party:

- 1 Station or DISA calls
- 2 Attendant-extended calls
- 3 TIE trunk or attendant-originated calls
- 4 CCSA or DID trunk calls

Five kinds of treatment can be given:

- 1 Route to Attendant
- 2 Provide Busy tone
- 3 Not applicable
- 4 Provide overflow tone
- 5 Route to recorded announcement

A roaming portable that originates a call encountering Intercept treatment is given intercept treatment as defined at the system where the portable is now located.

A call made to a portable while it is located at a visited site will receive the Intercept treatment defined for the visited TLDN.

For a call terminated to a roaming portable in the maintenance busy mode, MBNR intercept treatment is executed.

Network Call Transfer

ESN Network Call Transfer allows transferring a call back to the originating switch without requiring the use of tie trunks between the two switches after the transfer is completed.

Network Call Transfer operates in the same manner in both the home and the visited systems. For Multi-Site Networking, a portable can transfer a call as well as can be transferred at the visited system. However, the portable has to follow the visited system's numbering plan when transferring the call.

Network Meridian Mail

Network Message Services (NMS) uses the signalling capabilities inherent in ISDN access and ISDN Signalling Link (ISL) to provide customers with messaging services on a network rather than strictly on a local basis. Customers whose networks employ ISDN access or ISL will be able to extend the existing messaging services to any and all users served by that customer's network. Access to the Network Message Services, as well as feature activation from the messaging system, is transparent to the end-user.

A call originated from a portable can be redirected to the Network Message Services-Meridian Mail (NMS-MM) through call modifications defined on the terminating set. Calls terminating on a portable can be redirected to NMS-MM through call modifications.

To access the Network Message Service, the portable user will need to dial the number which must conform to the visited Meridian 1 numbering configuration (e.g. AC1+LOC+Meridian Mail DN).

Network Message Services-Meridian Mail (NMS-MM) is supported for the portable. However, no message will be sent to a roaming portable to indicate that there is an unretrieved message in the mailbox.

When a roaming portable user leaves a Meridian Mail message to another set, the TLDN will be stored as the calling party's DN. Therefore, when the called party invokes the "Call Sender" feature from Meridian Mail, the TLDN will be dialled. If the TLDN has been subsequently assigned to another roaming portable, the wrong user will be called.

System Speed Call

System Speed Call extends the capabilities of the Speed Call feature. It allows a user temporarily to override class of service and access restrictions for calls placed using the system speed call list.

For Multi-Site Networking, a roaming portable can only be a System Speed Call user and not the Speed Call Controller. Also, the roaming portable cannot access its home speed call list while at the visited system.

Administration

To support Multi-Site Networking, the customer sites must have the following prerequisites:

- Meridian Customer Defined Network (MCDN)
- Microcellular packages 302 and 303 and all Microcellular equipment installed at the user's home site and at each visited site
- Multi-Site Network Option package 314 installed at the user's home site and at each visited site
- All Meridian 1 systems on the same network must use a homogenous dialing plan. It can be either the Uniform Dialing Plan (UDP) or the Coordinated Dialing Plan (CDP), but not both. Multi-Site Networking does not support mixed dialing plans.
- Common customer Private Network Identifier (PNI)

Figure 8 illustrates the following procedures for configuring the Multi-Site Networking feature:

1 ISDN PRI Configuration (Meridian Customer Defined Network, MCDN).

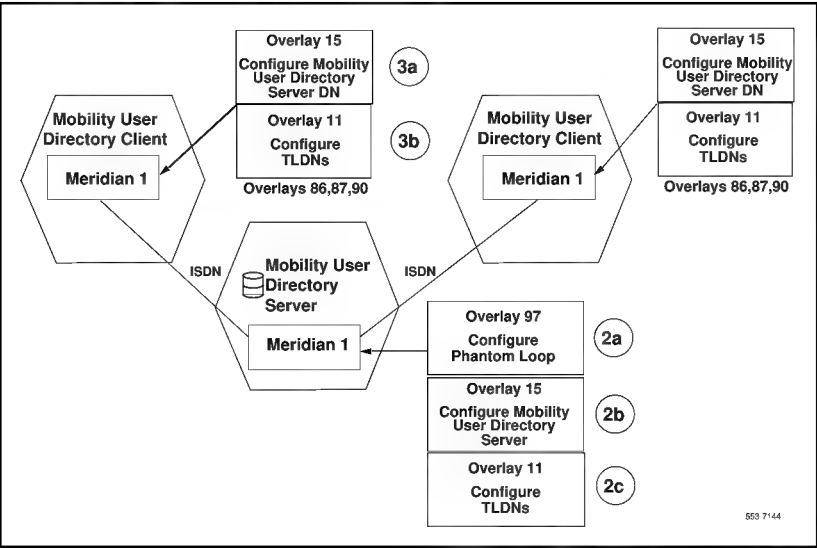
Note: For a description of MCDN configuration, see the following documents:

- *Electronic Switched Network description* (309-3001-100) introduces ESN, a private communications network intended for large businesses with distributed operating locations. Concepts described include network class of service, network alternate route selection, network control, network signaling, routing control, call back queuing, off hook queuing, network authorization codes, coordinated dialing plan, and network traffic measurements.
- *Electronic Switched Network transmission guidelines* (309-3001-181) describes the major transmission considerations in planning for an ESN. Topics include transmission planning and performance for on-network calls, tandem combinations of public and private network trunks, and remote network access.
- *Basic and Network Alternate Route Selection description* (553-2751-100) introduces concepts necessary for creating a private telecommunications network with switches in different locations. Information includes network access codes, uniform dialing plan, dialing transparency, automatic least-cost routing, routing and network controls, digit manipulation, free calling area screening, and expensive route warning tone.
- *ISDN Primary Rate Interface description and administration* (553-2901-100) introduces the ISDN and describes the features available on the Meridian 1 with ISDN PRI. Topics include an overview, PRI configuring, PRI service verification, coordinating PRI parameters, and engineering guidelines, as well as description of specific PRI features.

Note: For a description of prompts and responses for Meridian 1 software, see:

- *X11 input/output guide* (553-3001-400) serves as a reference guide for system administrators. It includes instructions for using administration and maintenance programs to configure and equip Meridian 1 features.
 - a** The entire MCDN, UPD/CPD, and PNI configuration must be checked point to point regardless of whether on not the multi-site networking is activated point to point or it tandems through an intermediate node. X11 release 22 is the minimum system software required for all nodes, including intermediate nodes.
 - b** Within one network, use the same Private Network Identifier (PNI) in both the Customer Data Block (Overlay 15) and the Route Data Block (Overlay 16) in all Meridian 1 Systems.
 - c** ISDN PRI supplementary features (e.g. Network Ring Again) can be used to validate the configuration of MCDN, CDP/UDP, and PNI. For the detailed description of Network Ring Again, see *ISDN Primary Rate Interface description and administration* (553-2901-100).
- 2** At the Meridian 1 node where the Mobility User Directory server will be running:
 - a** Use Overlay 97 to change the superloop configuration to a phantom loop.
 - b** Use Overlay 15 to define the Mobility User Directory server Directory Number (DN).
 - c** Use the Meridian Administration Terminal (MAT) to configure Temporary Local Directory Numbers (TLDNs) for visiting portables.
- 3** At each Meridian 1 node (client) on the private network:
 - a** Use Overlay 15 to enter the Mobility User Directory server DN.
 - b** Use MAT Station Administration to configure Temporary Local Directory Numbers (TLDNs) for visiting portables.

Figure 8
Multi-Site Networking administration



Phantom loop configuration

Use Overlay 97 to change the superloop configuration to phantom loop.

Table 2
Use Overlay 97 to configure phantom loop

Prompt	Response	Description
REQ	CHG	Change
TYPE	SUPL	Superloop
SUPL	N0-159	N represents phantom loop and the number selected must be a multiple of 4 (i.e. N4, N8, N12, etc.)

Configure of Mobility User Directory server

The Mobility User Directory server DN is defined in the Customer Data Block administration Overlay 15 at the node where the Mobility User Directory server will be running. The Mobility User Directory server DN and the customer's Private Network Identifier (PNI) will also be entered into the Mobility User Directory server address fields, automatically.

The location of the customer's Mobility User Directory server must be known to all sites within the network. At each Meridian 1 node on the network, use Overlay 15 (shown in Table 3) to configure the Mobility User Directory Server address. Its configuration data are:

- **Attribute:** Mobility User Directory server address.
- **Data Type:**
 - DN, or
 - Home location code for UDP + DN
- **Default:** None.
- **Description:** This DN is taken from the customer's numbering plan. It does not correspond to a real terminal at the node with the Mobility User Directory server. It is defined so that Mobility User Directory clients can send non-call associated messages to the server. Use Overlay 15 to configure the Mobility User Directory server.

Note: A test call must be made from each node on the network to the node at which the Mobility User Directory server is located. This action will ensure that the CDP/UDP numbering is configured correctly.

Table 3 illustrates using Overlay 15 for configuring the Mobility User Directory server.

Table 3
Use Overlay 15 to configure Mobility User Directory server DN
(Part 1 of 3)

Prompt	Response	Description
REQ	NEW	New

Table 3
Use Overlay 15 to configure Mobility User Directory server DN
(Part 2 of 3)

Prompt	Response	Description
TYPE	CDB	Customer data block
CUST	0-99	Customer number
....		
ISDN	YES	Allow ISDN for this customer
....		
-PNI	1-32700	Define Private Network Identifier
-MMSN	YES	Mobility Multi-Site Network (MMSN) node. Prompted only if MMSN package is equipped. Default is NO. Answer YES if using Multi-Site Networking option.
-APPL_DN	xx...x	Originating node that communicates with the Mobility User Directory server. Up to 7 digits. For example, use 4000 as the DN reserved for the application.
-DIAL_PLAN	(UDP), CDP	Dialing plan used by the customer. Be sure the dialing plan is consistent on all Meridian 1 nodes on the network. Default is UDP.
--MUD_SRVR	(NO), YES	Mobility User Directory server. Answer YES, if this Meridian 1 node will be running the Mobility User Directory server. Default is NO.

Table 3
Use Overlay 15 to configure Mobility User Directory server DN
(Part 3 of 3)

Prompt	Response	Description
---MUD_DN	xx...x	Mobility User Directory server DN. Up to 7 digits. Enter the Mobility User Directory Server DN if this Meridian 1 node will be running the Mobility User Directory server. Prompted only if MUD_SRVR is YES. For example, used 4001 as the DN reserved for the Mobility User Directory server.
....		

Configuration of Mobility User Directory server DN on client nodes

At each Meridian 1 node (client) on the private network, use Overlay 15 to enter the Mobility User Directory server DN.

Table 4
Use Overlay 15 to configure Mobility User Directory server DN on client nodes (Part 1 of 2)

Prompt	Response	Description
REQ	NEW	New
TYPE	CDB	Customer data block
CUST	0-99	Customer number
....		
ISDN	YES	Allow ISDN for this customer
....		
-PNI	1-32700	Define Private Network Identifier

Table 4
Use Overlay 15 to configure Mobility User Directory server DN on client nodes (Part 2 of 2)

Prompt	Response	Description
-MMSN	(NO), YES	Mobility Multi-Site Network (MMSN) node. Prompted only if MMSN package is equipped. Default is NO. Answer YES if using Multi-Site Networking option.
-APPL_DN	xx...x	Originating node that communicates with the Mobility User Directory server. Up to 7 digits. For example, use 4000 as the DN reserved for the application.
-DIAL_PLAN	(UDP), CDP	Dialing plan used by the customer. Be sure the dialing plan is consistent on all Meridian 1 nodes on the network. Default is UDP.
--MUD_SRVR	(NO), YES	Mobility User Directory server. Answer NO, if this Meridian 1 system is a client node. Default is NO.
---SRVR_LOC	xx...x	Home location code of the Mobility User Directory server. Up to 7 digits. Prompted only if DIAL_PLAN = UDP and MUD_SRVR is NO.
---SRVR_DN	xx...x	Mobility User Directory server DN. Up to 7 digits. Prompted only if MUD_SRVR = NO.
....		

TLDN configuration

A pool of Temporary Local Directory Numbers (TLDNs) are configured on every Meridian 1 system on the network to handle roaming portables. Use the Meridian Administration Terminal (MAT) software to configure a pool of TLDNs to support the number of visiting users at each Meridian 1 system. Attributes of TLDNs are similar to those for portables except that MIN and ESN ID are not prompted.

For information about configuring TLDNs, see the *Meridian Administration Tools Common Services User guide (A0658266)*.

Portables capable of roaming

Operation, Administration, and Maintenance (OA&M) of portables with roaming capability are performed at the home location MAT. Portables are defaulted to be local users only when they are created (NEW operation). Adding Multi-Site Networking requires updating the portable's configuration via a CHANGE operation. Configuring Companion Microcellular has already defined the MIN and DN of each portable. Therefore, if a customer subscribes to the Multi-Site Networking feature, their portables' MINs and DNs are added to the Mobility User Directory automatically when the portables are configured.

In addition, the Call Forward All Calls to External DN Allowed (CFXA) class of service is *required* for delivering calls made to the portable's home DN to the portable at a visited node.

Feature Testing

Once you have completed the configuration of the Multi-Site Networking feature, perform the following steps to test the numbering plan.

- 1 Verify that the Mobility User Directory server DN can be reached from each node on the network.
- 2 Ensure that the Mobility Multi-Site Networking Application DN for each of the networked sites can be reached by all of the other networked sites.
- 3 Verify that all of the TLDNs can be reached from the other networked sites.

Test the capabilities of the Microcellular Multi-Site Network by performing the following steps

- 1 Originate and terminate a call at the home Meridian 1.
- 2 Travel to a networked site and perform call origination and termination through the Meridian 1 at the visited site.
- 3 Return to the home site and originate and terminate a call at the home Meridian 1.

Error codes

Multi-Site Networking error codes include operation codes that specify the operation during which an error or errors occur and return errors that specify the errors or errors.

Table 5 lists the Multi-Site Networking operation codes.

Table 5
Multi-Site Networking operation codes

Operation code	Value	Meaning
MMSN_REGNOT	13	Registration notification.
MMSN_REGCANC	14	Portable registration canceled
MMSN_QUERYMUD	51	Query the Mobility User Directory (MUD)
MMSN_ADD2MUD	52	Add a portable MIN and ESN to the MUD
MMSN_DELFMUD	53	Delete a portable MIN and ESN from the MUD
MMSN_AGING	54	De-assign all TLDNs from portables at midnight

Table 5 lists the return errors for Multi-Site Networking operations.

Table 6
Return errors for Multi-Site Networking

Error code	Value	Meaning
Unrecognized MIN	H.81	The portable's MIN is probably not configured in the database or is configured incorrectly.
Unrecognized ESN	H.82	The portable's ESN is probably not configured in the database or is configured incorrectly.
MIN/HLR Mismatch	H.83	The MIN is not in the HLR.
Operation Sequence Problem	H.84	
Trunk unavailable	H.87	
Parameter Error	H.88	
System Failure	H.89	
Unrecognized Parameter Value	H.8A	
Feature Inactive	H.8B	
Missing Parameter	H.8C	
MMSN_NOT_CONFIG	H.11	Multi-Site Network Option package 314 is not installed on the Meridian 1 system or is not configured correctly.
MMSN_QMUD_FAIL	H.12	The query to the MUD failed because the system did not recognize the MIN, the query message was lost due to a timeout, or some other reason indicated by additional return errors.
GET_TLDN_FAIL	H.13	A TLDN was not available, probably because all TLDNs at the site were in use.

Table 6
Return errors for Multi-Site Networking

Error code	Value	Meaning
GET_VPTN_FAIL	H.14	A virtual physical TN and TLDN were not available, probably because all TLDNs at the site were in use.
ADD2MUD_FAIL	H.15	The MUD was not updated with an addition.
DELFRMUD_FAIL	H.16	The MUD was not updated with a deletion.
GET_CUSTNO_FAIL	H.17	The customer number is wrong, or the data is corrupted.
WRONG_DEST_PNI	H.18	The Private Number Identification (PNI) was wrong, or the data was corrupted.
MOBDATA_PTR	H.19	Multi-Site Networking could not obtain a pointer to portable data stored on the switch.
TIMEOUT	H.1A	The switch or a DCH might be down.
TNTRANS_FAIL	H.1B	The data might be corrupted.
NO_DIALING_PLAN	H.1C	A dialing plan is not configured or is configured incorrectly.
MMSN_SNDROAMBCK	H.1D	A portable failed to roam back home during an aging operation because the home DN was missing or a TLDN mismatch occurred.
MISSING_HOMEDN	H.1E	Multi-Site Networking could not obtain a portable's home DN during an aging operation.
TLDN_MISMATCH	H.1F	A portable's TLDN did not match the Call Forward DN at the home site during an aging operation.

List of terms

cellular operator

A cellular operating company that holds a license to operate and control cellular equipment within a certain geographical region using a defined range of frequencies. These operators must provide a spectrum for in-building operation of Companion Microcellular.

CCRS

Controlled Class of Service - the restricted class of service level applied to a locked station.

CDP

Coordinated Dialing Plan

Cellular

Mobility systems using radio techniques which provide wide coverage by splitting regions into cells, where adjacent cells use different frequencies. Includes both Macrocellular and Microcellular systems.

CLS/COS

Class of Service

DN

Directory Number

ESN

Electronic Serial Number or Electronic Switched Network.

HLR

Home Location Register

ISDN

Integrated Services Digital Network

Incoming Call

A Call that terminates (comes “in”) on a portable or a wired set.

LDN

Listed or Local Directory Number

M1

Meridian 1

MIN

Mobile Identification Number

MM

Meridian Mail

Microcell(ular)

Cells and cellular systems provided by cellular operators or private companies authorized by the cellular operator, using low power base stations with smaller cell sizes, in either public or private domains.

Mobility Server

A server that provides an abstracted interface to clients, hiding all radio-standard-specific messaging from the client. If the radio standard is changed, minimal changes to the interface with the client are needed.

NCOS

Network Class of Service

OA&M

Operation, administration, and maintenance

Outgoing Call

A call that originates (goes “out”) from a portable or a wired set.

PBX

Private Branch Exchange

PNI

Private Network Identifier

Portable

A portable is any Microcellular wireless set.

Registration

The process in which a portable informs the system of its presence in a cell, and requests permission to use the system's services. This includes both initial registration on first entering the system (except during hand-off when it is implicit). The process includes checking if the portable has the right to roam into this system, and updates to the relevant Home Location Register (HLR) and Visited Location Register (VLR). This is distinct from authentication.

Roaming

In its purest form, the term "roaming" refers to the ability of microcellular system subscribers to be served by systems outside of their home system while still having all of the same capabilities that they would have in their home system (as opposed to call delivery, which refers to terminating a call to the subscriber regardless of location).

SPRE

Special Prefix

Temporary Local Directory Number (TLDN)

A Directory Number (DN) which is used to route incoming calls to roamers. A TLDN is assigned by the visited switch to a successfully registered portable that is roaming at the visited switch.

TCOS

Travelling Class of Service

TGAR

Trunk Group Access Restriction

TN

Terminal Number

UDP

Uniform Dialing Plan

Virtual Terminal Number (VTN)

VTNs are used by call processing software to uniquely identify a portable. This TN is not associated with any physical hardware and is strictly for identification purposes.

VLR

Visitor Location Register

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Meridian 1

Nortel COMPANION Microcellular Multi-Site Networking

Description, operations, and
administration

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